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The present invention relates to the making of wall board for building purposes, and more particularly discloses an apparatus and method for manufacturing wall board with a frangible or cementitious core or body portion which is bound in and reinforced by a fibrous covering of paper or the like.

The present invention pertains more particularly to the making of such a board so that the fibrous covering is formed in a substantially integral sheath about an elongate slab which continuously issues from the machine and may be cut into suitable lengths. In providing for the making of a wall board of this character the principles of the Fourdriner and cylinder mold paper machines are combined with components of the ordinary apparatus for making wall boards, plaster or the like, whereby formation and assembly of the wall board may take place in a continuous operation and in one combination of machines.

It is thus possible to provide a wall board which is similar to that disclosed in my copending application Serial No. 131,661, filed August 26, 1926, or may be of the form commonly associated with plaster boards which are bound by paper or the like, with the exception that the fibrous envelope or sheath which surrounds the core of the plaster board made by the present process may be substantially integral and the paper or fibrous coating may be united with the plastic core by an unusually strong interlocking bond. With these general objects in view it will appear from the following description that the process and apparatus may be varied in different ways to suit various materials used and to provide various resulting types of wall board.

The above and further objects and advantages of the invention will be apparent to those skilled in the art upon a reading of the subjoined description and claims in conjunction with the accompanying drawings, in which:

Fig. 1 is a diagrammatic sectional view of the apparatus for making the improved wall board:

Fig. 2 is a perspective view of a portion of the wall board;

Fig. 3 is a section on line 3-3 of Fig. 1;

Fig. 4 is a section on line 4-4 of Fig. 1;

Fig. 5 is a section on line 5-5 of Fig. 1;

Fig. 6 is a section on line 6-6 of Fig. 1;

and

Fig. 7 is a section on line 7-7 of Fig. 1.

In order to provide a wall board having a central core or body portion of frangible or cementitious material, such as gypsum, preferably calcined, and having, if desired, a suitable fibrous aggregate combined therewith, it is proposed, in accordance with the present invention, to combine the principles and operations of paper making with the principles and operations of making plaster boards. For this purpose two paper making factors are combined with an intermediate factor for the production of a gypsum core and with means to combine the fibers layers and the core into an integral continuous strip which may be cut into wall boards of suitable length.

In order to provide a fibrous layer or coating for one side of the wall board, which will be the lower side, as the board is produced in the machine, apparatus of the general type associated with the conventional Fourdriner machine is provided and is diagrammatically illustrated at the left of Fig. 1 and designated by the numeral 1. A flow box 3 is adapted to supply pulp composed of any suitable fibrous material suspended in a liquid such as water, for instance, suitably prepared wood fibers combined with ground paper to such a proportion as is suitable for making heavy wrapping paper, or minute chips, shredded wood fibers mixed with cotton fibrous, or similar substances.

This fibrous material 2 passes upon a wire or felt 7 and is drawn through a suitable series of rolls 4 and passes through drying box 5. The rolls and drying box, as disclosed in Fig. 3, have a width less than that of the belt 7 which supports the pulp so that the intermediate portion of the pulp is pressed and dried to a much greater extent than the loose edge portions 8 thereof which are located next to the decks 9. After the inter-
mediate portion of the pulp has thus been partially dehydrated, gypsum 33 in a plastic stream is poured onto the same. This material comes from an elevated hopper 10 which is adapted to contain comminuted gypsum with or without an aggregate and with either an accelerator or decelerator to aid or retard drying, if desired. The plastic material falls upon a moving belt 13 which dips into a vat 14 where the gypsum is hydrated and from which it passes under slices 16 which control the thickness of the gypsum layer and thence drops over the roll 17 upon the moving pulp layer 2. Suitable press rolls 19, Fig. 3, compact the gypsum upon the intermediate portion of the moving pulp and tend to press the loose edge portions thereof outwardly against the decks 8, as disclosed in Fig. 4.

After the gypsum or the like has been suitably compressed and somewhat dried, the upper layer of fibrous material is introduced from an elevated source of pulp, designated generally by the numeral 21, and comprising a suitable number of rolls combined with a conveying belt 22 adapted to bring the upper layer of fibrous material upon the gypsum and pulp. A suitable series of rolls 23, Fig. 5, is provided to press the upper layer of fibrous material upon the gypsum and upon the undried pulp at either side, thus effecting in various stages partial dehydrating of the masses of pulp at either side of the gypsum and the upper layer of pulp, and causing still further drying of the lower layer of pulp; it being evident that the amount of water which is drawn from the upper layer and the marginal masses of the pulp will be much greater than that which is forced from the lower layer of pulp during this part of the process.

It may be further observed that the upper layer of fibrous material is deposited upon the main body of moving material without passing through a drying box, so that the marginal masses of pulp and the upper layer of pulp have substantially the same water content and may be readily forced into an intimate bonded relation to comprise a substantially integral continuous layer about the intermediate gypsum mass. Also it will be evident that there will be no sharp line of demarkation between the marginal masses and the bottom layer of fibrous pulp so that the marginal masses and the bottom and top layers will both be substantially integral and continuous and there will be no sharply defined zones in which the percentages of water are radically different. After the upper and lower layers have thus been pressed upon opposite sides of the intermediate gypsum layer, suitable press rolls 32 at either side of the moving material are adapted to effect transverse compression, pressing the pulp mass against the gypsum core and providing both that core and the fibrous material with substantially square edges, Fig. 6. These rolls may preferably be arranged in conjunction with upper and lower rolls 36 in order to compress the moving mass upon all sides. After having passed through a suitable series of rolls of this character the material, which has now sufficiently dried, is passed between a pair of saws 35 which are adapted to trim the edges 8 of the fibrous sheath 38 so that edge portions of the fibrous coating will have a thickness substantially equal to the upper and lower layers, it obviously being impractical originally to form these portions with a restricted thickness of this order. In certain cases it may be desirable to permit the marginal portions of the plaster board to remain covered with a fibrous layer which is considerably thicker than the fibrous covering upon the faces of the board. A board of this type will be similar to that disclosed in my above-identified copending application and will have fibrous marginal portions upon either side sufficiently wide to permit the ready nailing thereof when the plaster board is located upon a wall or ceiling, as more particularly described in said application.

Leaving the saws, the wall board passes in a continuous strip upon suitable conveyor 95 rolls from which it may be removed in suitably cut sections, and after which it is further dried to provide the type of wall board disclosed in Fig. 2, which comprises an intermediate slab of frangible material preferably having a base of calcined gypsum 33 which may be mixed with suitable aggregate and a substantially continuous sheath or binding of fibrous material 43. Obviously wall board of this character will be unusually strong due to the lack of joints or seams in the fibrous covering and due to the firm bond between the fibrous and plastic material resulting from the concomitant formation and drying of these substances in intimate contact with one another.

I claim:

1. The process of making wall board which comprises concomitantly forming a frangible core and an outer sheet of fibrous material thereon, by providing a moving layer of hydrated fibrous pulp with marginal masses of pulp at either side of the layer of greater thickness than the intermediate portion thereof, placing a layer of hydrated cementitious material upon the intermediate portion of the pulp layer, and concomitantly drying the materials and pressing them into intimate engagement.

2. The process of making wall board which comprises providing a lower continuously moving layer of fibrous material and marginal masses of hydrated pulp at either side of the fibrous layer, locating a mass of hydrated plastic material upon the fibrous ma-
5. The process of making wall board which comprises providing a lower continuously moving layer of fibrous material and marginal masses of hydrated pulp at either side of the fibrous layer, locating a mass of hydrated plastic material upon the fibrous material between the marginal masses, bringing an upper layer of hydrated fibrous material upon the marginal masses and the plastic material, and effecting the concomitant drying and compacting of the hydrated fibrous material and plastic.

4. The process of making fiber board which comprises locating a hydrated intermediate layer of plastic material within an outer surrounding layer of hydrated fibrous material, making said outer layer continuous about the intermediate layer, and effecting the concomitant drying and compacting of the layers into intimate union.

5. The process of making fiber board which comprises locating a hydrated intermediate layer of plastic material within an outer layer of hydrated material, making said outer layer continuous about the intermediate layer, adjoining portions of which have similar moisture contents, and effecting the concomitant drying and compacting of the layers into intimate union.

6. The process of making wall board which comprises providing a lower moving layer of hydrated cellulose fibers, partially dehydrating the same, providing marginal masses of similar material which retain a larger percentage of liquid, bringing an intermediate stream of plastic material upon the lower layer and between the marginal masses, locating an upper layer of fibrous material having a moisture content similar to that of the marginal masses above the plastic and said masses, and concomitantly drying and compacting the resulting combination.

7. The process of making wall board which comprises providing a lower moving layer of hydrated cellulose fibers, partially dehydrating the same and providing marginal masses of similar material which retain a larger percentage of liquid, bringing an intermediate stream of plastic material upon the lower layer and between the marginal masses, locating an upper layer of fibrous material having a moisture content similar to that of the marginal masses above the plastic and said masses, and compressing the resulting combination both transversely and vertically.

8. The process of making wall board which comprises providing a lower moving layer of hydrated cellulose fibers, partially dehydrating and compressing the central portion of the layer, while leaving marginal masses with substantially their original thickness and liquid content, bringing an intermediate stream of plastic material upon the lower layer and between the marginal masses, locating an upper layer of fibrous material having a moisture content similar to that of the marginal masses above the plastic and said masses, and compressing the resulting combination both transversely and vertically.

9. The process of making wall board which comprises providing a lower moving layer of hydrated cellulose fibers, partially dehydrating and compressing the central portion of the layer, while leaving marginal masses with substantially their original thickness and liquid content, bringing an intermediate stream of plastic material upon the lower layer and between the marginal masses, locating an upper layer of fibrous material having a moisture content similar to that of the marginal masses above the plastic and said masses, and compressing the resulting combination both transversely and vertically.

10. The process of making wall board which comprises providing a lower moving layer of hydrated cellulose fibers partially dehydrating the same, providing marginal masses of similar material but retaining a larger percentage of liquid, bringing an intermediate stream of plastic material upon the lower layer and between the marginal masses, compressing the plastic upon the lower layer of fibrous material to effect partial dehydration of the same, locating an upper layer of fibrous material having a moisture content similar to that of the marginal masses above the plastic and said masses, and concomitantly drying and compacting the resulting combination.

11. Wall board comprising a frangible slab and an uninterrupted, continuous fibrous covering about the same, said covering being free from joints or seams.

12. The process of making wall board which comprises providing a lower continuously moving layer of hydrated pulp and marginal masses of hydrated pulp at either side of the layer of hydrated pulp, which are superposed upon the margins of the pulp layer, locating a mass of hydrated plastic material upon the hydrated pulp layer between the marginal masses, bringing an upper layer of fibrous material upon the marginal masses and the plastic material, and effecting the concomitant drying and compacting of the hydrated fibrous material and the plastic material.

13. The process of making wall board which comprises providing a lower continuously moving layer of hydrated pulp and similar marginal masses of hydrated pulp at either side of the layer of hydrated pulp, which are superposed upon the margins of...
the pulp layer, locating a mass of hydrated plastic material upon the hydrated pulp layer between the marginal masses, bringing an upper layer of hydrated pulp upon the marginal masses and the plastic material, and effecting the concomitant drying and compacting of the hydrated fibrous material and the plastic material.

Signed by me at Portsmouth, New Hampshire this twenty-eighth day of October, 1926.

HARRY C. RAYNES.